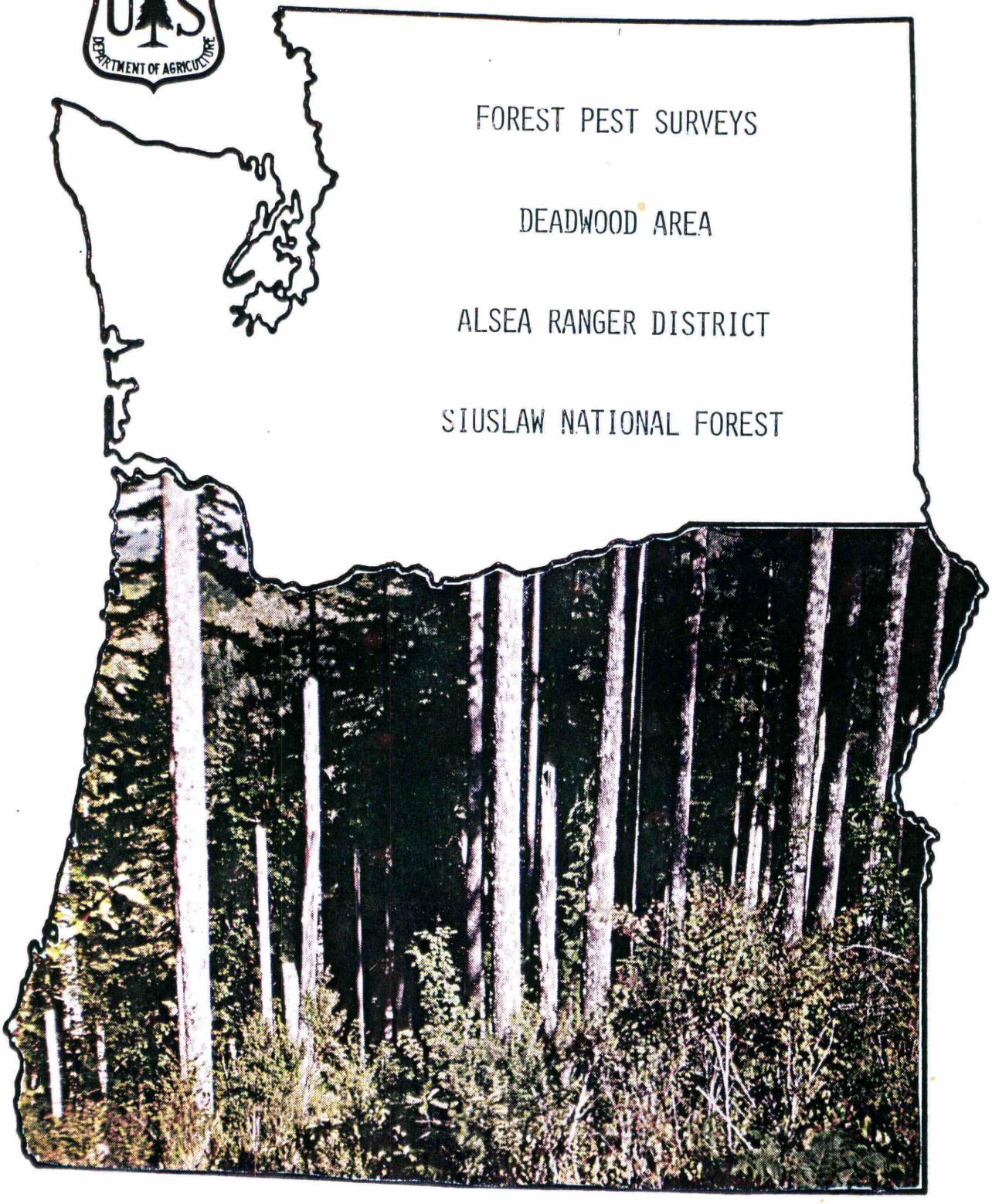
Forest Pest Management
Pacific Northwest Region

FOREST PEST SURVEYS

DEADWOOD AREA

ALSEA RANGER DISTRICT

SIUSLAW NATIONAL FOREST



FOREST PEST SURVEYS, DEADWOOD AREA, ALSEA RANGER DISTRICT, SIUSLAW NATIONAL FOREST

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INTRODUCTION

During September, October, and November 1982, Forest pest surveys were done in 28 stands, totalling 1,155 acres, in the Deadwood area, Alsea Ranger District, Siuslaw National Forest (Fig. 1). Laminated root rot (caused by the fungus *Phellinus (Poria) weirii*) has for some time been recognized as a common and damaging problem in the southern part of the Alsea District. District personnel requested the assistance of Forest Pest Management to evaluate pest conditions on recent timber sales in the Deadwood area, determine amount and location of laminated root rot and other pest damage, and provide management recommendations to minimize loss from forest pests in future stands on the units.

METHODS

Each stand was surveyed by running a series of transects at two-chain intervals across each unit. Distances were measured along each transect and all areas between lines were reconnoitered. All dead, symptomatic and windthrown trees and groups of trees, and all stumps in areas that had been salvage-logged in the past were examined for evidence of insect infestation or disease. Two roots on opposite sides of standing dead or symptomatic trees were excavated to a distance of 3 feet from the root collar and examined for evidence of root disease. Roots and butts of stumps and windthrown and dead standing trees were dissected to determine character of wood decay. Trunks of trees were examined for signs and symptoms of heartrot, including conks and large wounds, and bark was removed from stems of dead trees to expose bark beetle galleries, if present, for species determination.

Using measurements along transect lines, disease centers and areas of insect infestation were mapped for each unit. Resource color aerial photographs were used to help confirm location of large openings in stands and pinpoint unit boundaries. Data provided by the survey were amount and location of area affected by each forest pest.

RESULTS AND DISCUSSION

Units surveyed in the Deadwood area varied somewhat in character but tended to be of high site quality (Site I or II) and mostly occurred on fairly steep slopes. Existing stands were predominantly in the 130- to 150-year-old age group, but several were older stands (300 years old or more). Douglas-fir (*Pseudotsuga menziesii*) was the major tree species in all stands. Secondary conifer species were western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*). Most stands had a heavy understory of salal (*Gaultheria shallon*), huckleberry (*Vaccinium ovatum* and *V. ovalifolium*), and vine maple (*Acer circinatum*). Red alder (*Alnus rubra*) and big-leaf maple (*Acer macrophyllum*) were common in stand openings.

Many of the stands exhibited considerable evidence of pest-caused damage and unusually high potential for loss in the next rotation. In addition to laminated root rot, brown cubical butt rot (caused by *Phaeolus schweinitzii*) and Douglas-fir beetles (*Dendroctonus pseudotsuga*) were causing damage in some stands. The following are more detailed discussions of the major pests:

Laminated Root Rot - By far the most commonly encountered and damaging forest pest in the evaluation units was laminated root rot. This disease was identified by the typical, laminated wood decay that separates readily at the annual rings (Fig. 2); the reddish, whiskery setal hyphae that appear between the sheets of rotted wood (Fig. 3); and the grayish, crusty ectotrophic mycelia on root bark (Fig. 4). Laminated root rot centers encountered in the surveys contained both dead standing trees and windthrows with roots rotted off just below the root collar to form characteristic "root balls." Many root rot pockets were difficult to detect from a distance because down trees were hidden by heavy underbrush (Fig. 5). Also, a substantial proportion of the large disease pockets had been salvage-logged in the past.

Figures 6 through 30 show area affected by laminated root rot in the 28 surveyed stands, and Table 1 gives percentage of area involved in disease centers for each stand. Only three stands had no disease, six were lightly diseased (less than 10 percent of the area affected), six were moderately diseased (10 to 25 percent of the area affected), and 13 were severely diseased (25 percent or more of the area affected). Overall, compared to other areas in the Region, these disease levels are extremely high.

Laminated root rot is a particularly dangerous disease because of its devastating effect on the host and because the causal agent is persistent on the site. The fungus can survive for up to 50 years in roots of old stumps and infect, via root contacts, new hosts that become established on the site. Infection centers develop and increase in size due to subsequent spread from tree to tree along roots.

Recommended control for laminated root rot is to harvest all susceptible hosts in infection centers and a 50-foot buffer around each, and (1) mechanically remove all inoculum (infected roots and stumps) with heavy equipment, or (2) leave inoculum but replant with immune, resistant, or intermediately susceptible tree species that are adapted to the site. Mechanical removal of inoculum is effective and allows the manager to replant with any tree species desired but it is expensive, difficult on steep terrain, and may contribute to substantial soil damage. Unless an infected stand is on a level, high-quality site with a relatively light soil, tree species manipulation in disease centers is a more viable control alternative.

In the Deadwood area, tree species by increasing degree of susceptibility are IMMUNE - hardwoods; RESISTANT - western redcedar; INTERMEDIATELY SUSCEPTIBLE - western hemlock; and HIGHLY SUSCEPTIBLE - Douglas-fir. If only immune species are planted on an infected site and grown for a rotation (50 years or more), *P. weirii* will die out, and a highly susceptible species such as Douglas-fir could be grown in the following rotation with almost no likelihood of additional losses. If resistant species are used, there should be much the same result, although there may be a small amount of infection and retention of the pathogen. If intermediately susceptible species are grown for a rotation, they should suffer relatively little apparent damage. However, many may be infected,

a few may die, and the disease will be maintained on the site. Subsequent planting with highly susceptible species will result in a renewed disease problem. If a heavily diseased site is cut and replanted immediately with Douglas-fir, severe losses can practically be guaranteed. Many Douglas-fir plantations adjacent to the surveyed stands in the Deadwood area are already exhibiting very spectacular evidence of disease.

Brown Cubical Butt Rot - Scattered, broken Douglas-fir infected by *P. schweinitzii* were observed in most stands surveyed. Brown cubical butt rot was identified by the characteristic blocky to crumbly, brown-colored advanced decay bordered by reddish incipient decay and by the associated flat, brown fruiting bodies. Detectable infected trees were especially common in Divide Up Timber Sales 3503-98 and 3503-100 and Divide Ridge Timber Sales 3503-105 and 3503-107.

Brown cubical butt rot is damaging mainly in fairly old stands. The pathogen is spread by windborne spores and gains entrance into the host via wounds and fire scars. Development of major decay columns takes many years. The disease is usually not a direct tree killer but, by causing heartwood decay in the butt and roots, it can predispose trees to breakage, windthrow, or attack by other pests. Brown cubical butt rot is best controlled by avoiding long rotations.

Douglas-fir Beetles - Scattered, dead standing Douglas-firs that had been infested by Douglas-fir beetles were found in many of the survey stands and concentrations of infestation were observed in Divide Up Timber Sale 3503-103 and Divide Ridge Timber Sales 3503-104 and 3503-108. Douglas-fir beetles were identified by their long, vertical adult galleries with alternating groups of horizontally branching larval galleries.

For the most part, Douglas-fir beetles are not primary tree killers. They usually attack and breed in severely weakened or windthrown trees. However, if there are many such suitable trees in a stand, beetle populations may build up to high levels. The beetles may then infest nearby healthy trees. In the survey areas, beetle-caused mortality was most common near steep slopes where there was evidence of substantial amounts of past blowdown, in disturbed areas along roads, and in and around laminated root rot centers.

Control of Douglas-fir beetles is attained by promoting and maintaining a vigorous stand. Injured trees should be removed before beetles can attack, and windthrown trees should be salvaged either before they are infested or before the next generation of beetles emerges. Disease control will greatly aid in reducing beetle activity in an area like the Deadwood block. Douglas-fir beetle is common in the Deadwood area because of the seriousness of the laminated nated root rot. They are attracted to the root rot weakened and windthrown trees. Disease management strategies that move away from Douglas-fir in the infected areas will result in significant reductions in losses to Douglas-fir bark beetles.

MANAGEMENT RECOMMENDATIONS

We believe that treatment of laminated root rot in the Deadwood area is a critical need. Our detailed surveys of 28 units and observations of surrounding stands and plantations strongly indicate that laminated root rot is distributed virtually throughout the entire area. In fact, we believe that the Deadwood block has as much laminated root rot as any comparably sized area in the Pacific

Northwest. Amount of area affected in many of the individually surveyed stands was phenomenal and current damage in most was moderate to severe. If these units are harvested and regenerated with Douglas-fir in the normal fashion without taking root disease into account, we project very great losses in future rotations. There is a high probability that if no disease management is done on these sites, they will produce under intensive management only 40 to 60 percent as much wood as would undiseased sites of comparable quality.

The seriousness of the laminated root rot in the Deadwood area can be seen in the following simplistic calculations. At the present time, 32 percent of the area surveyed has openings or symptomatic trees. Recently published data reveal that approximately 50 percent of the area infested by laminated root rot can be detected by above-ground symptoms; therefore, the 32 percent area infested is extremely conservative. For the sake of calculations, assume 40 percent is infected (in actuality, probably 50 percent is infested). On the infested areas, assume yields at the end of an 80-year rotation will be reduced by 50 percent; again, this is very conservative. We will assume no spread (this is not at all realistic--the disease will spread radially 1 foot per year). If we assume the cumulative yield per healthy acre in the Deadwood area at the end of the rotation is 80 MBF, the falldown to laminated root rot is:

HEALTHY
1,155 acres x 80 MBF/Ac. = 92.4 MMBF

DISEASED
1,155 acres x 40 percent = 462 acres infection
1,155 - 462 = 693 acres healthy
693 acres x 80 MBF = 55.4 MMBF
462 acres x 40 MBF = 18.5 MMBF

TOTAL YIELD -- 73.9 MMBF or a loss of 18.5 MMBF.
As explained, this projected loss is unrealistically conservative because it underestimates the area now infested and it assumes no spread.

We make the following specific management recommendations for the timber sale areas surveyed in this evaluation:

1. Divide stands into four groups based on amount and distribution of laminated root rot:

   a. Undiseased stands--Divide Up 3503-98 and 3503-100, Divide Ridge 3503-105.

   b. Lightly diseased stands--Minister Clean-up 3504-91 and 3504-92, Deadwood Taylor 3505-145, Deadwood Bottom 2, Divide Ridge 3503-108 and 3503-109.

   c. Moderately and severely affected stands with clearly defined diseased and undiseased areas--Deadwood Taylor 3505-147, Divide Up 3503-99, 3503-101, and 3503-103, Deadwood Ponds 3503-153, Deadwood Lobster 3503-139, Deadwood West 3505-64, Deadwood Bottom 3, Divide Ridge 3503-104, 3503-106, and 3503-107.

   d. Moderately and severely affected stands with generally distributed disease--Minister Clean-up 3504-93 and 3504-95, Deadwood Taylor 3505-146, Deadwood Ponds 3505-154, Deadwood Lobster 3503-144, Deadwood Bottom 1 and 4, Divide Ridge 3503-105.

2. Clearcut stands according to normal schedule.

3. Following harvest, treat diseased areas in all units with laminated root rot by replanting sites with red alder (first choice), western redcedar (second choice), or western hemlock (only if alder and/or western redcedar cannot be used). For stands that were classified in Group B above (lightly diseased stands), use maps provided in this report to locate disease pockets and plant alternate species in the disease centers and a 50-foot buffer around each. Plant the remainder of the area with Douglas-fir. For stands that were classed in Group C (moderately and severely affected stands with clearly differentiable diseased and undiseased areas), block out diseased sections based on the maps in this report and plant alternative species in these areas. Be liberal in determining boundaries of disease blocks. Plant Douglas-fir in remaining, undiseased areas. For stands that were classified in Group D (moderately and severely affected stands with disease distributed throughout), reforest the entire unit with alternate species.

4. During precommercial thinning entries in stands or portions of stands that have had alternative tree species planted for laminated root rot control, remove all Douglas-fir naturals.

5. Plan rotations of at least 50 years for stands or portions of stands planted with alternate species.

6. In treated areas regenerated with red alder and/or western red cedar, plan on reforesting with Douglas-fir in the next rotation. In treated areas planted with western hemlock, do not plan on reforesting with Douglas-fir in the next rotation but plan to plant again with alternate species.

7. Plan rotations of not more than 120 years for disease-free stands or portions of stands that are replanted with Douglas-fir. Plan to salvage blowdown that occurs in accessible portions of these stands. These precautions will minimize loss from decay (especially that caused by *P. schweinitzii*) and Douglas-fir beetles in these healthy stands.

8. Keep complete records of disease control treatments so that succeeding silviculture staffs can continue the prescription.

In addition to these recommendations for the timber sales that were intensively surveyed, we strongly suggest that other stands in the Deadwood block be examined for laminated root rot and, where appropriate, have disease treatments incorporated into their prescriptions.

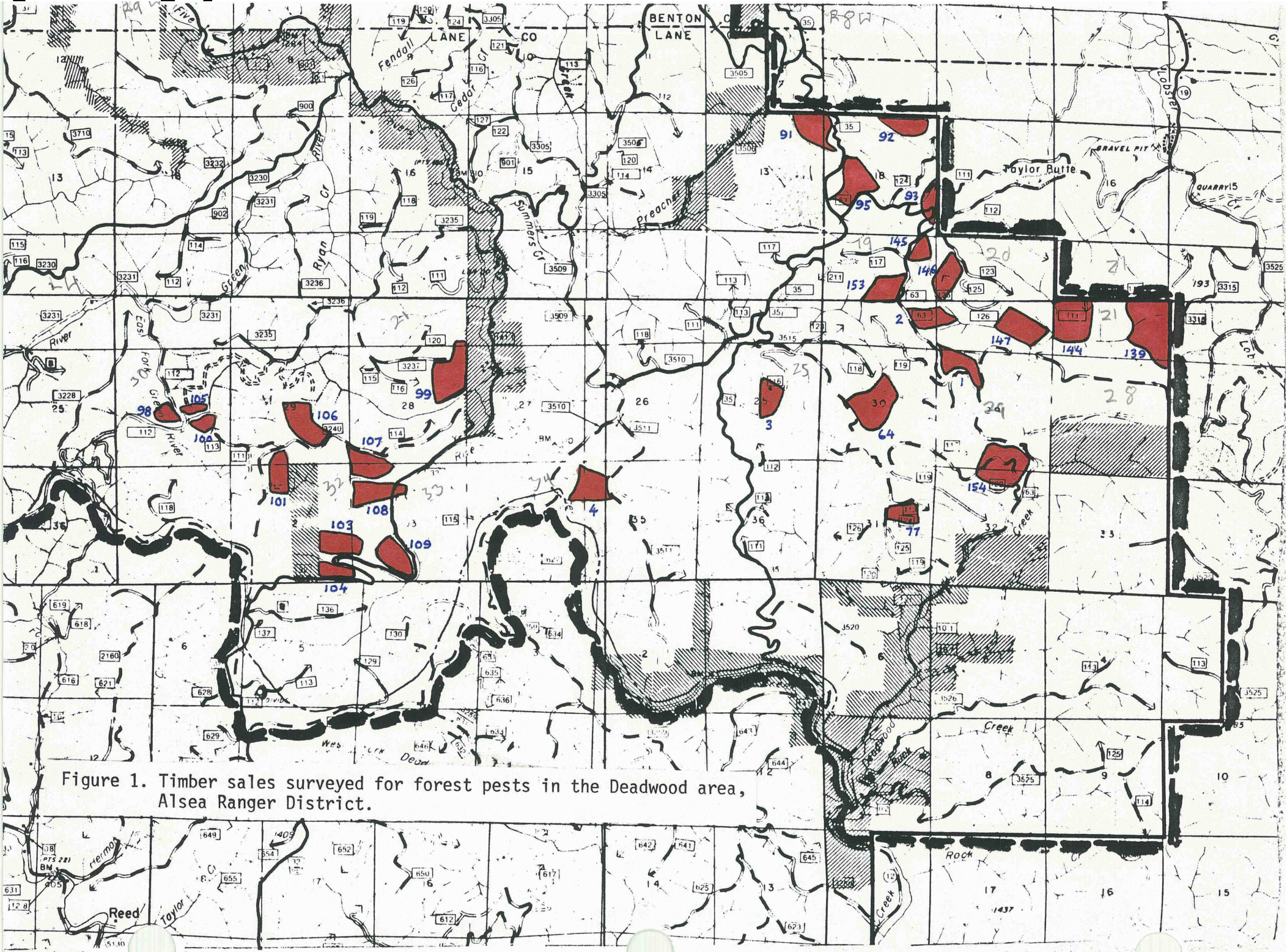

Figure 1. Timber sales surveyed for forest pests in the Deadwood area, Alsea Ranger District.

Table 1: Amount of laminated root rot detected in surveys of timber sales in the Deadwood Area, Alsea Ranger District

Timber Sale		Area (Acres)	% of Area in Laminated Root Rot Pockets	Additional Notes
Minister Clean-up	3504-91	34	0.7	Considerable alder; Douglas-fir present looks vigorous; disease looks old
Minister Clean-up	3504-92	43	8.6	
Minister Clean-up	3504-93	19	58.3	Heavy partial cut in past; many hemlock and cedar; disease in adjacent young stand
Minister Clean-up	3504-95	48	75.5	Has been salvaged; disease scattered throughout
Deadwood Taylor	3505-145	56	6.6	Disease not very active in this stand--mostly looks old
Deadwood Taylor	3505-146	34	52.7	Partially old growth; many hemlock and cedar; active disease also in adjacent stands to S., E., W.
Deadwood Taylor	3505-147	25	43.1	Partially old growth; severe disease in adjacent plantation as well
Divide Up	3503-98	7	0.0	Some windthrow--brown cubical rot caused by *P. schweinitzii*
Divide Up	3503-99	60	11.9	Much blowdown without disease in S. end between drainage and plantation; disease in plantation to N.
Divide Up	3503-100	17	0.0	Poorly stocked; considerable evidence of mountain beaver; some *P. schweinitzii*
Divide Up	3503-101	43	18.7	Has been salvaged; lots of windthrow and logging damage; many mountain beaver; some *P. schweinitzii*
Divide Up	3503-103	25	11.1	Some history of salvaging; considerable area of Douglas-fir beetle kills in W. end
Deadwood Ponds	3505-153	58	50.0	Harvested and burned, summer 1982; adjacent plantation to NW also diseased
Deadwood Ponds	3505-154	46	15.8	Harvested 1982; laminated root rot mostly detected in large Douglas-fir stumps; adjacent stand severely diseased
Deadwood Lobster	3505-139	114	32.3	Old-growth stand; lots of hemlock and cedar; tremendous blowdown
Deadwood Lobster	3505-144	70	55.1	Stand partially cut; some old growth; fairly active disease
Deadwood West	3505-64	71	29.0	Very steep; old growth at bottom; bad disease in adjacent plantation
Deadwood Bottom	1	29	79.7	Has been heavily salvaged
Deadwood Bottom	2	34	8.9	Relatively light disease
Deadwood Bottom	3	34	28.2	Has been heavily salvaged
Deadwood Bottom	4	58	78.7	Heavy mountain beaver population; tremendous number of stems on ground; disease active
Deadwood Bottom	77	30	19.3	Harvested 1981; replanted with Douglas-fir and some cedar and hemlock; bad disease to N.
Divide Ridge	3503-104	31	40.0	Some past salvage; some Douglas-fir beetle activity
Divide Ridge	3503-105	16	0.0	Large trees, wide spacing; considerable mountain beaver activity; some *P. schweinitzii*
Divide Ridge	3503-106	54	39.8	Old growth; considerable cedar and hemlock; considerable windthrow; mountain beaver
Divide Ridge	3503-107	41	20.0	Old growth; quite a bit of *P. schweinitzii*
Divide Ridge	3503-108	25	6.2	Lots of mountain beaver, windthrow, and Douglas-fir bark beetles
Divide Ridge	3503-109	33	1.0	Some salvage logging; heavy mountain beaver

Fig. 2: Laminated decay caused by *Phellinus weirii*

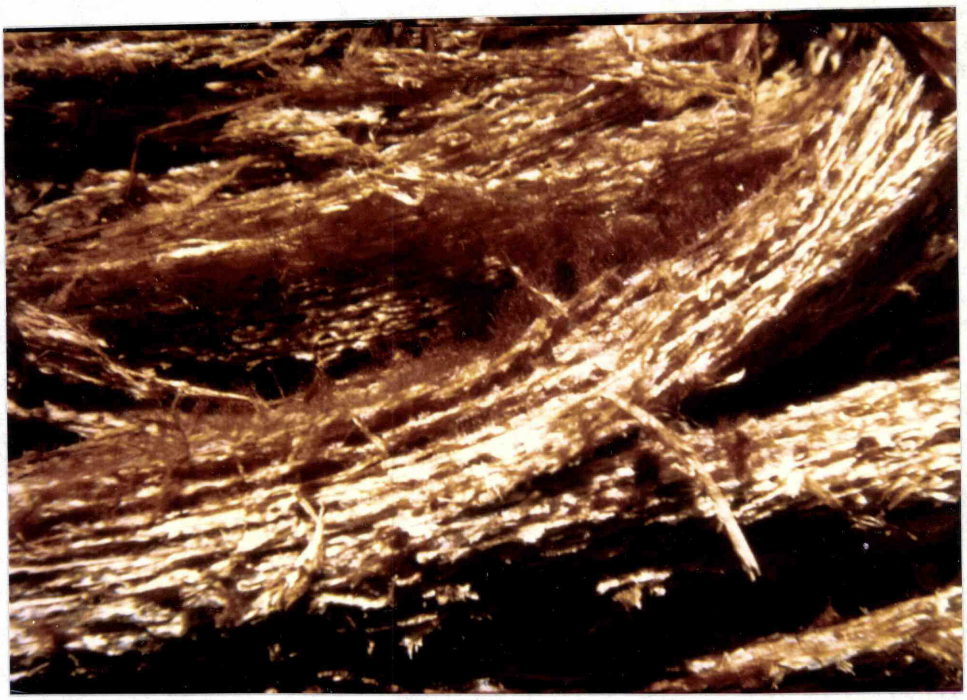

Fig. 3: Enlarged (3X) view of setal hyphae between layers of *P. weirii* decayed wood. These structures are diagnostic of the pathogen.

Fig. 4: Gray, crusty ectotrophic mycellium of *P. weirii* growing on bark of Douglas-fir roots

Fig. 5: Typical large laminated root rot pocket in the Deadwood area. From a distance, this appeared to be just a sizable opening in the stand. Close examination revealed many down Douglas-fir hidden by underbrush.

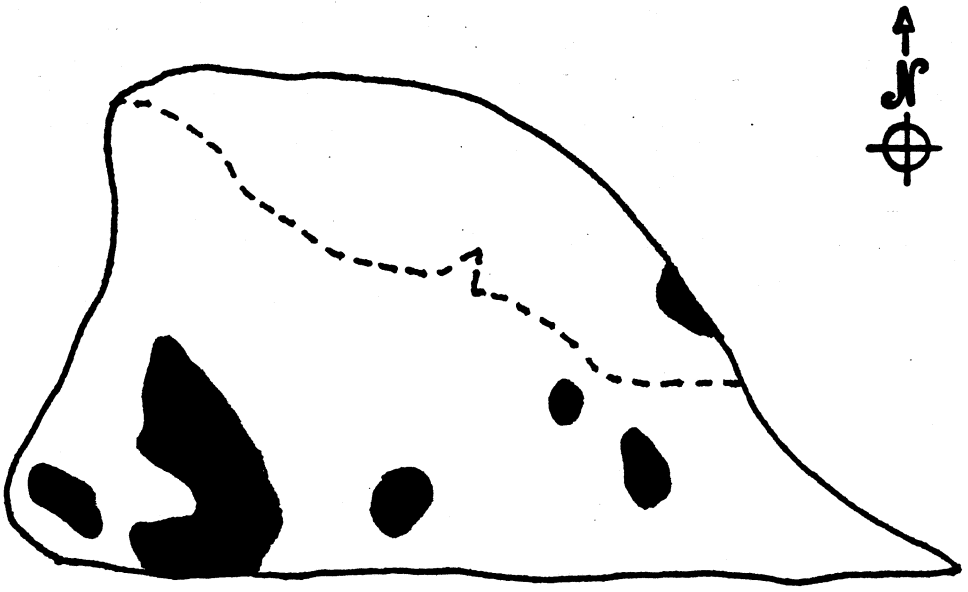

Fig. 6: Map of Minister Clean-up 3504-91 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

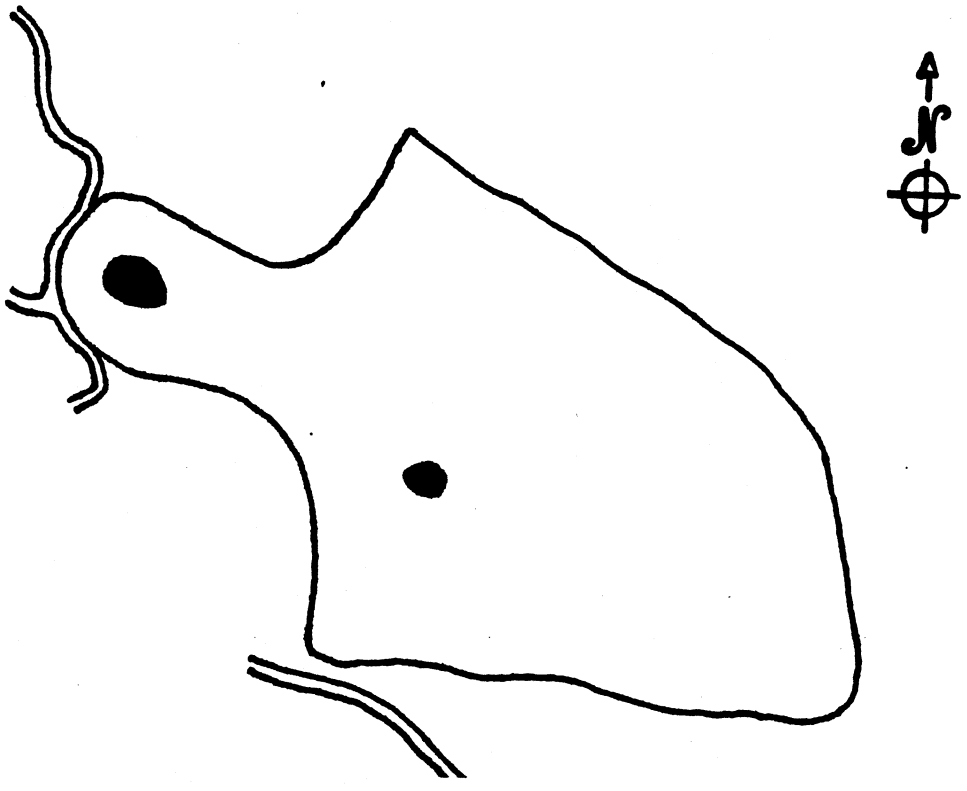

Fig. 7: Map of Minister Clean-up 3504-92 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

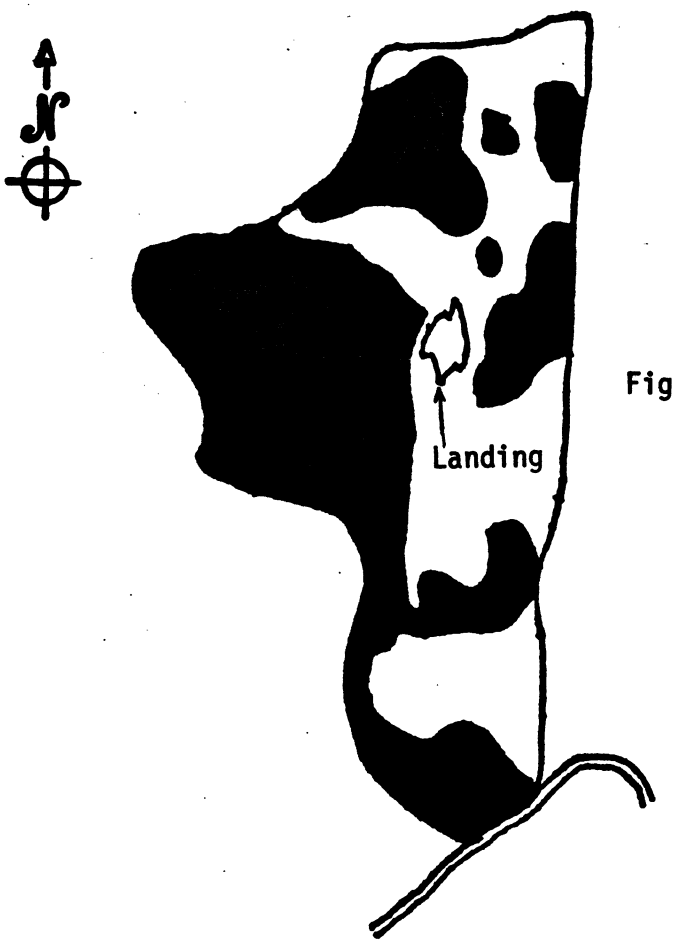

Fig. 8: Map of Minister Clean-up 3504-93 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

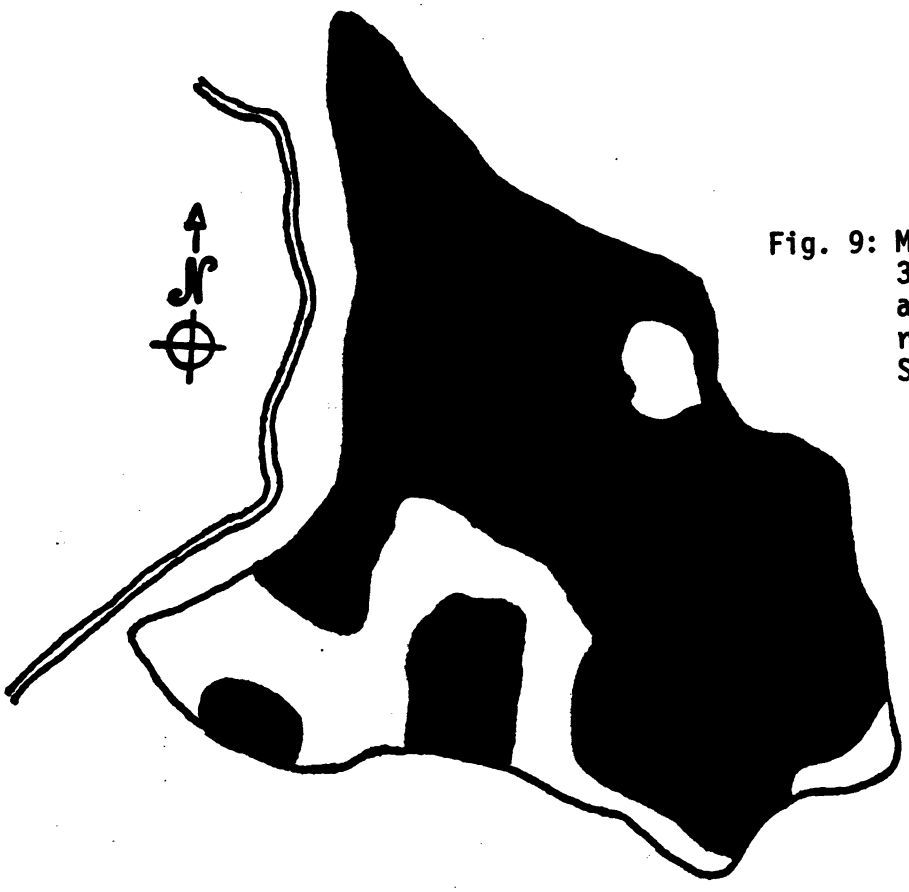

Fig. 9: Map of Minister Clean-up 3504-95 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

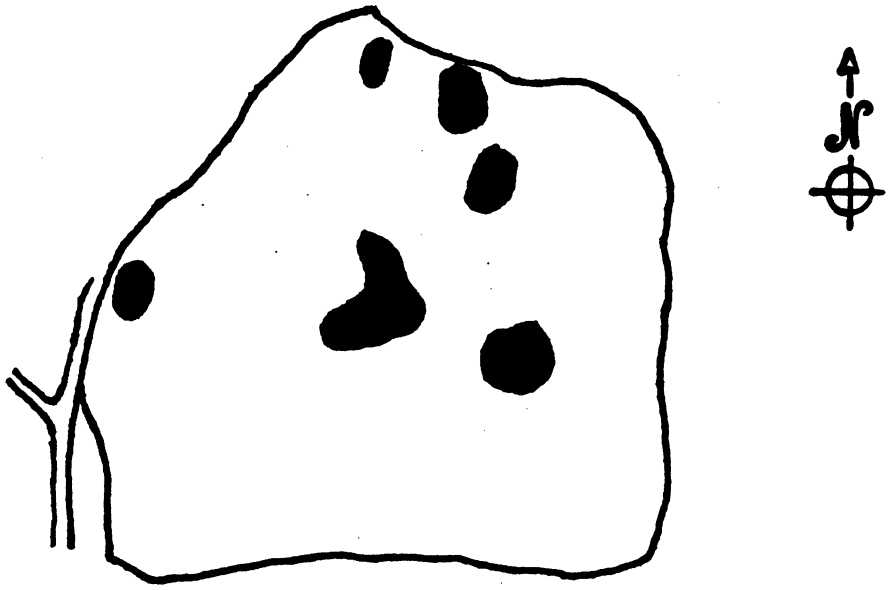

Fig. 10: Map of Deadwood Taylor 3505-145 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

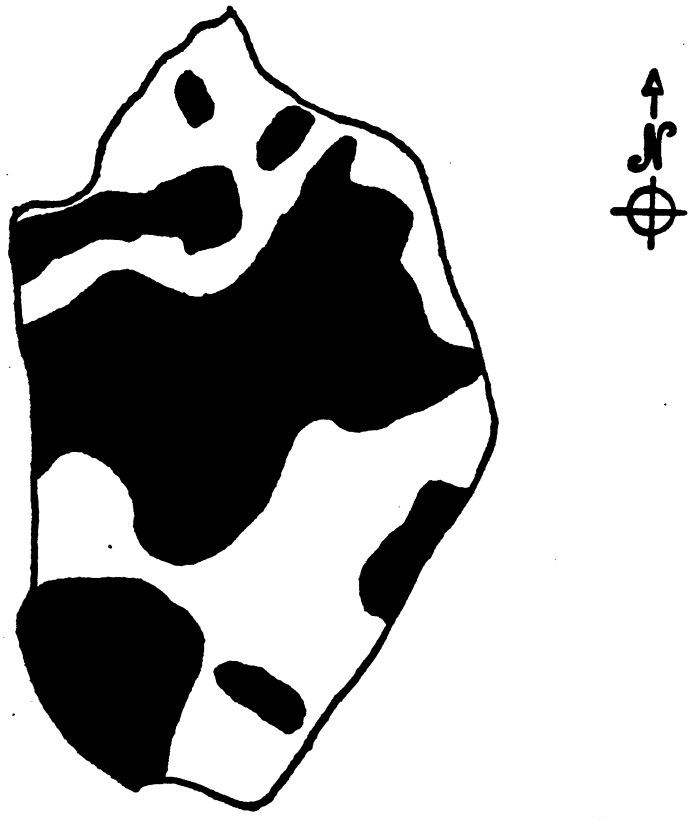

Fig. 11: Map of Deadwood Taylor 3505-146 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

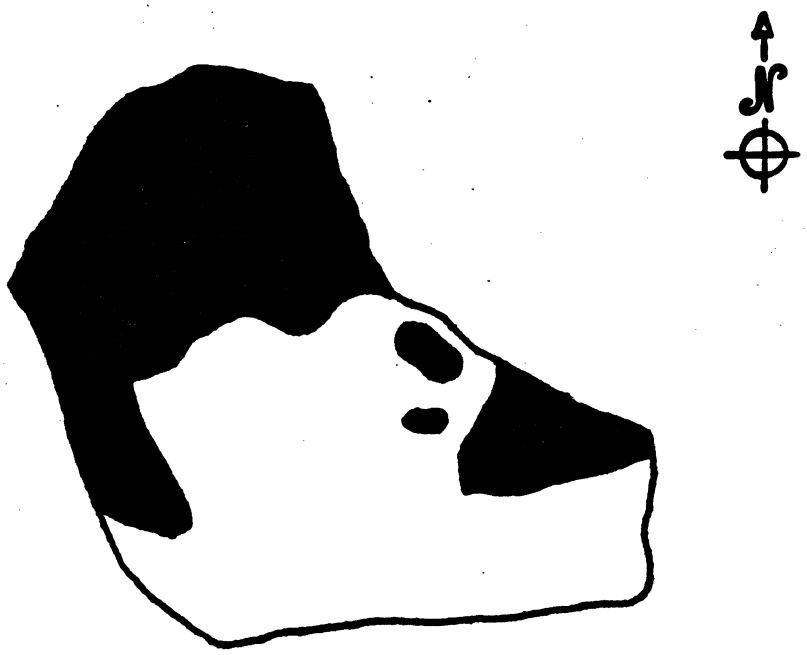

Fig. 12: Map of Deadwood Taylor 3505-147 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

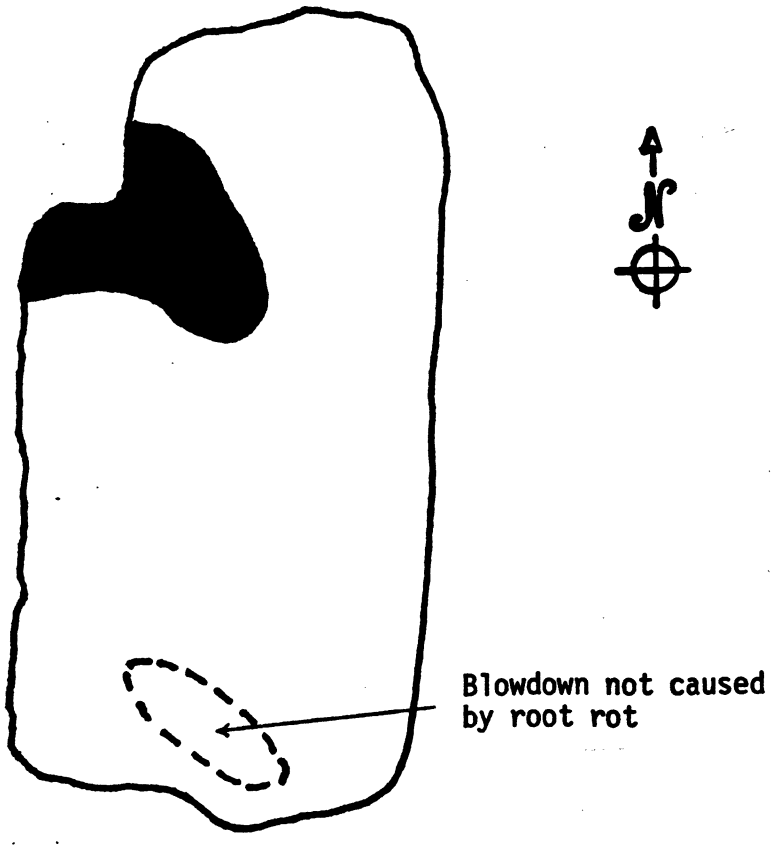

Fig. 13: Map of Divide Up 3505-99 Timber Sale showing area affected by laminated root rot (shaded section). Scale= 600 feet to the inch.

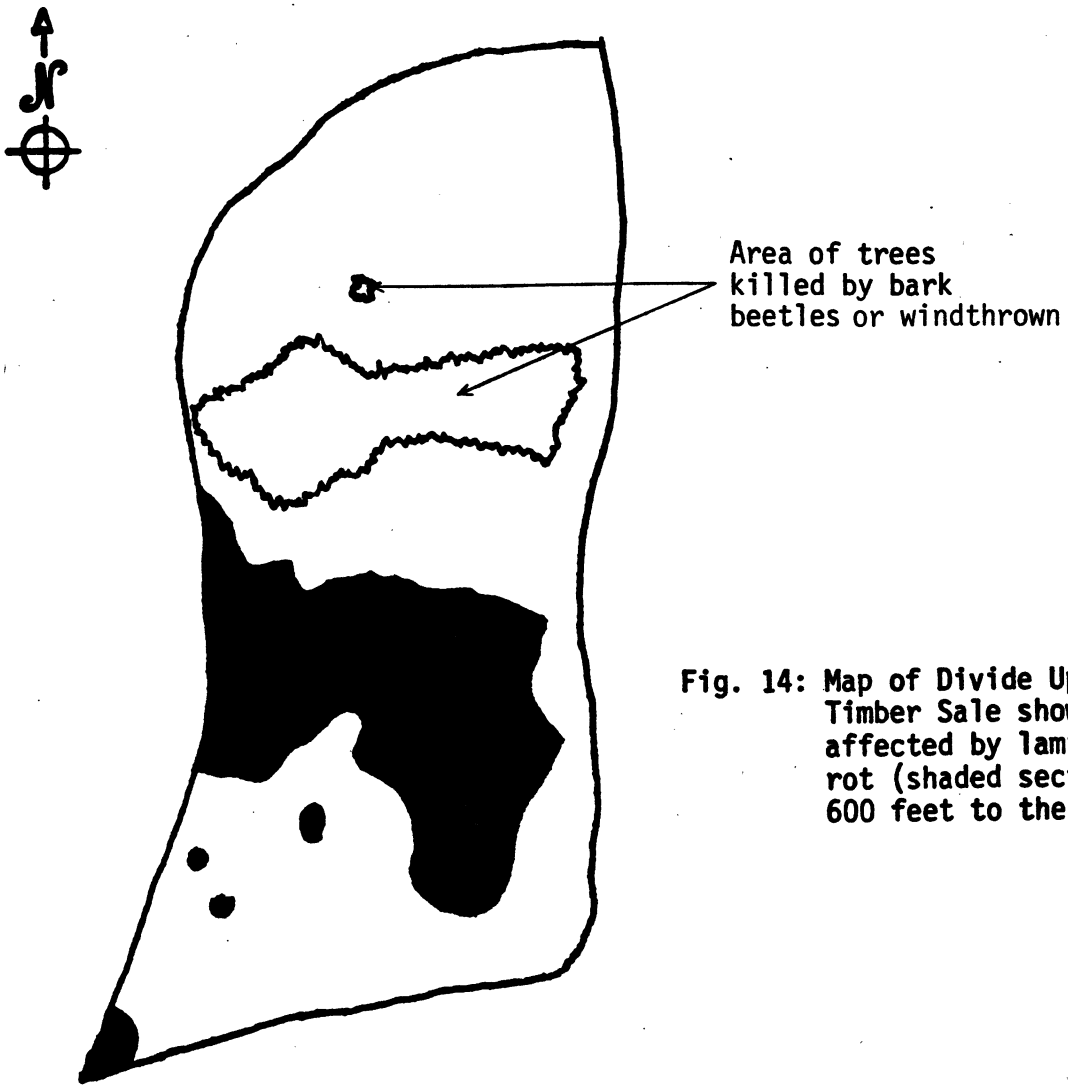

Fig. 14: Map of Divide Up 3503-101 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

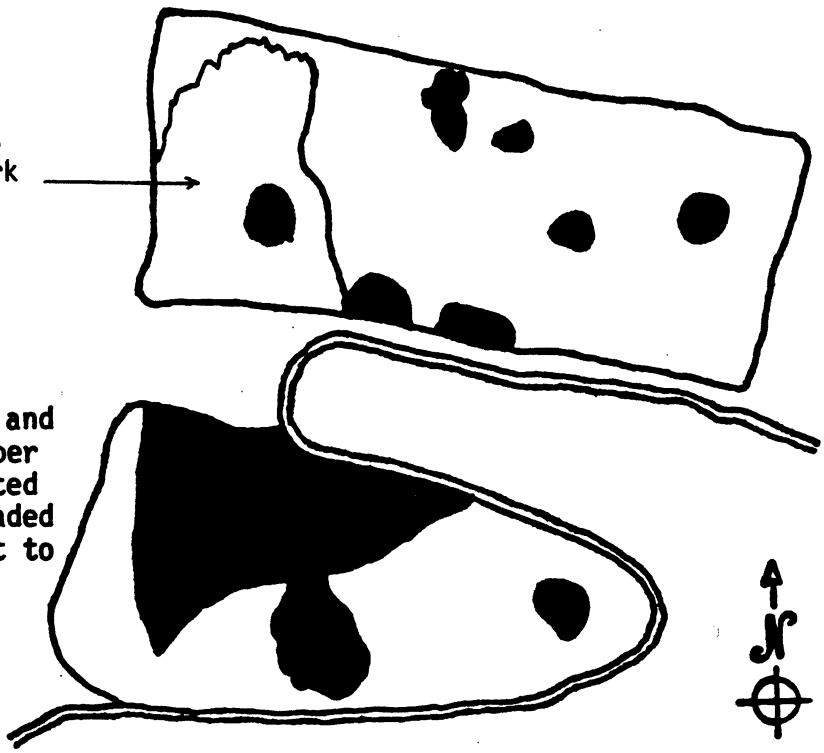

Fig. 15: Map of Divide Up 3503-103 and Divide Ridge 3503-104 Timber Sales showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

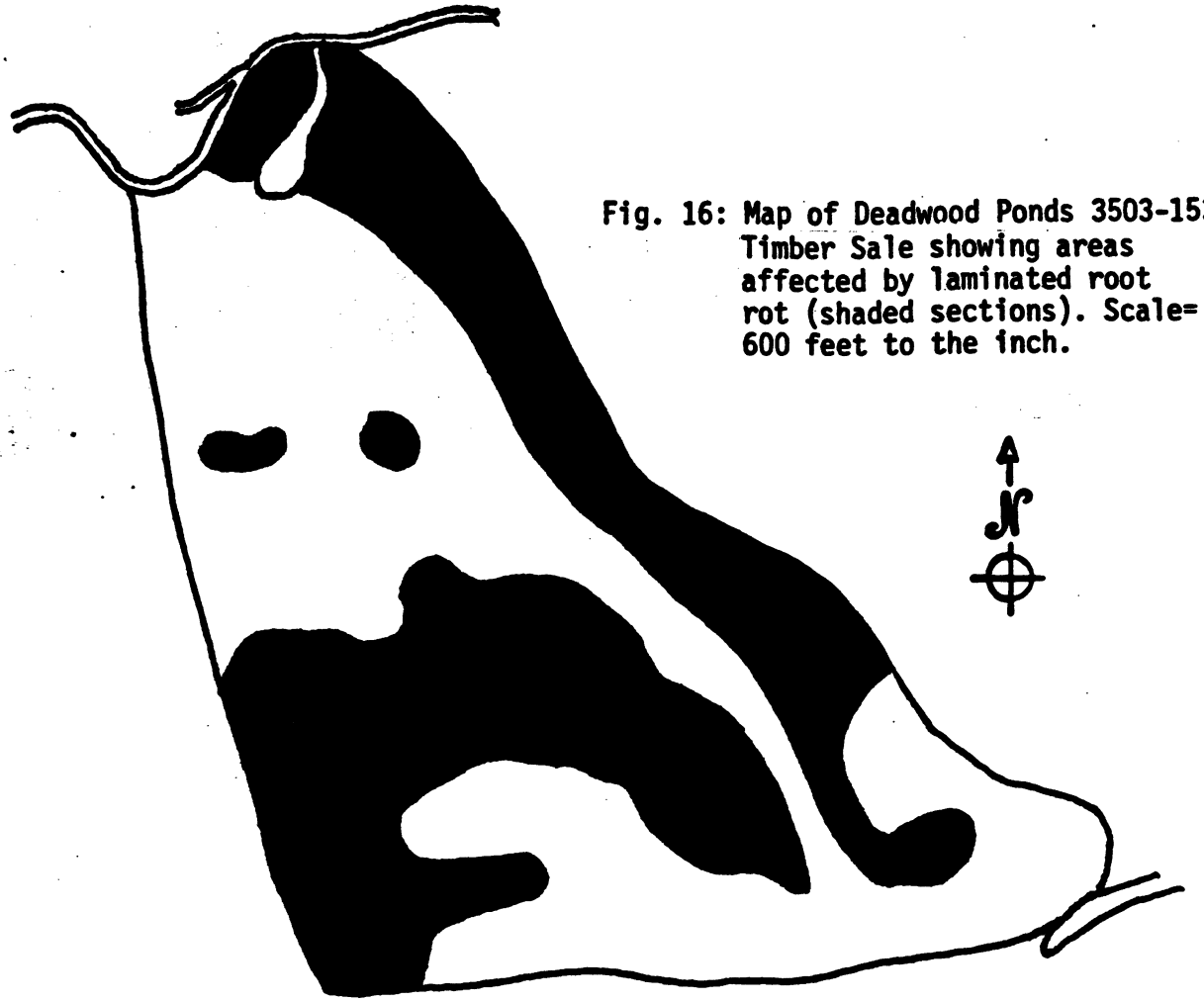

Fig. 16: Map of Deadwood Ponds 3503-153 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

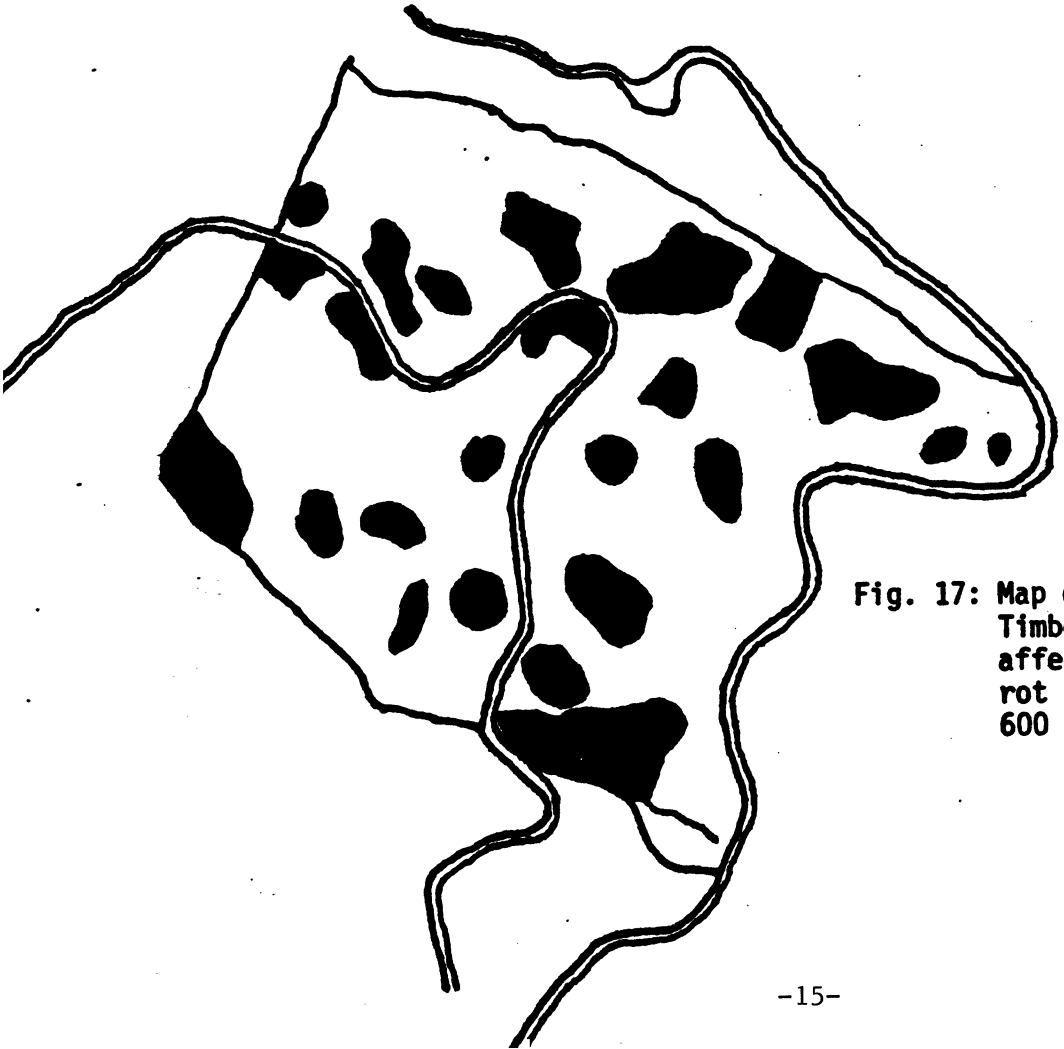

Fig. 17: Map of Deadwood Ponds 3503-154 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

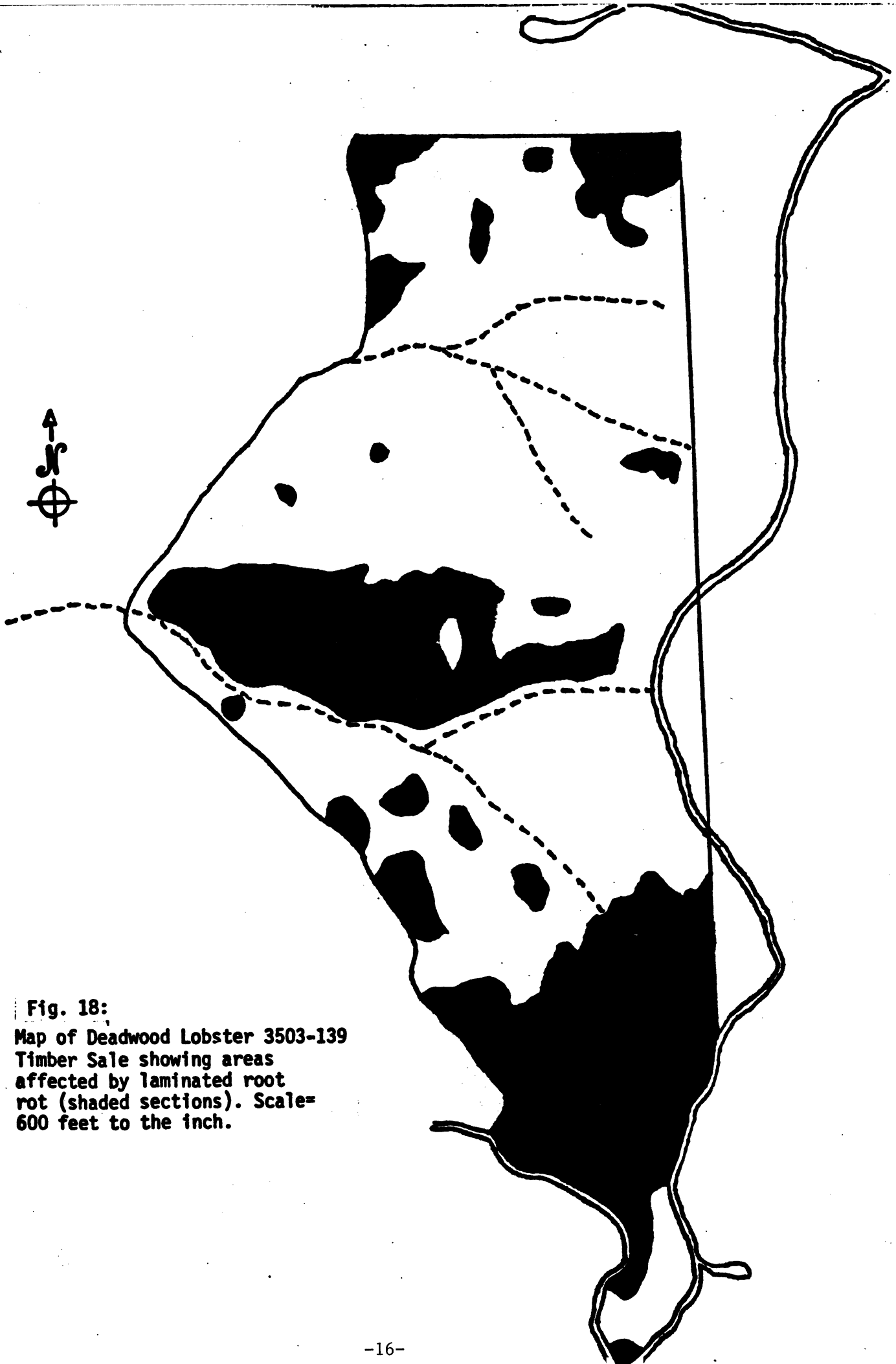

Fig. 18:
Map of Deadwood Lobster 3503-139 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

Fig. 19: Map of Deadwood West 3505-64 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

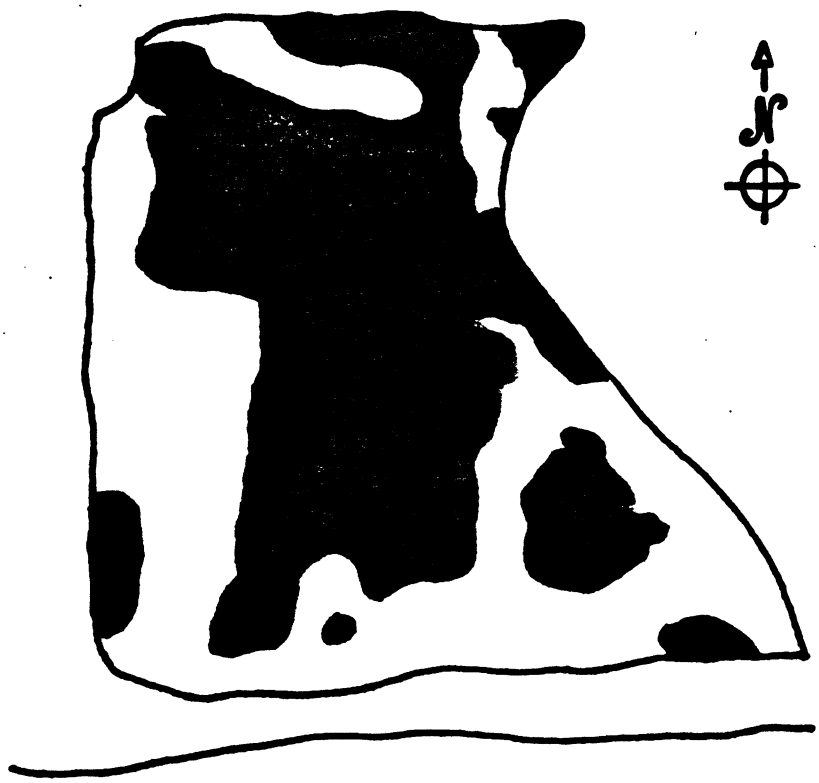

Fig. 20: Map of Deadwood Lobster 3505-144 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

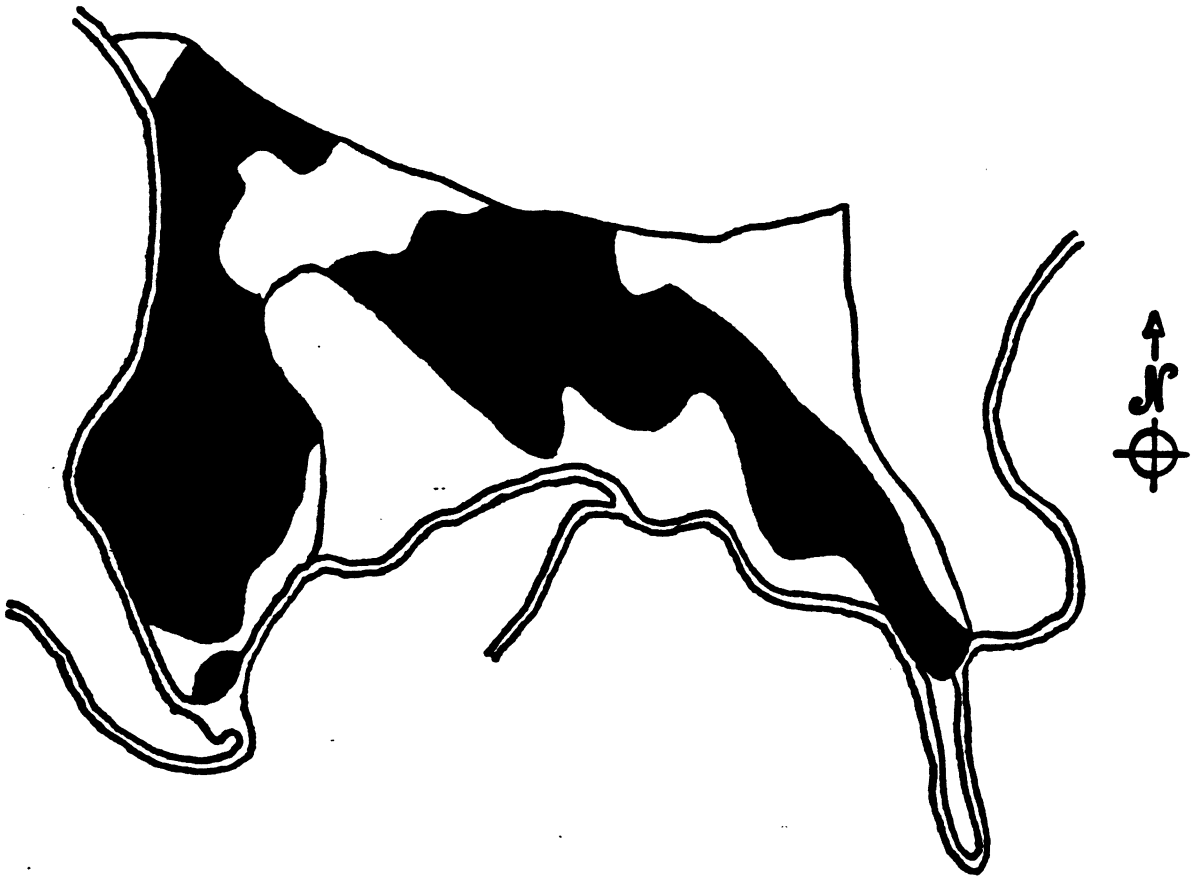

Fig. 21: Map of Deadwood Bottom 1 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

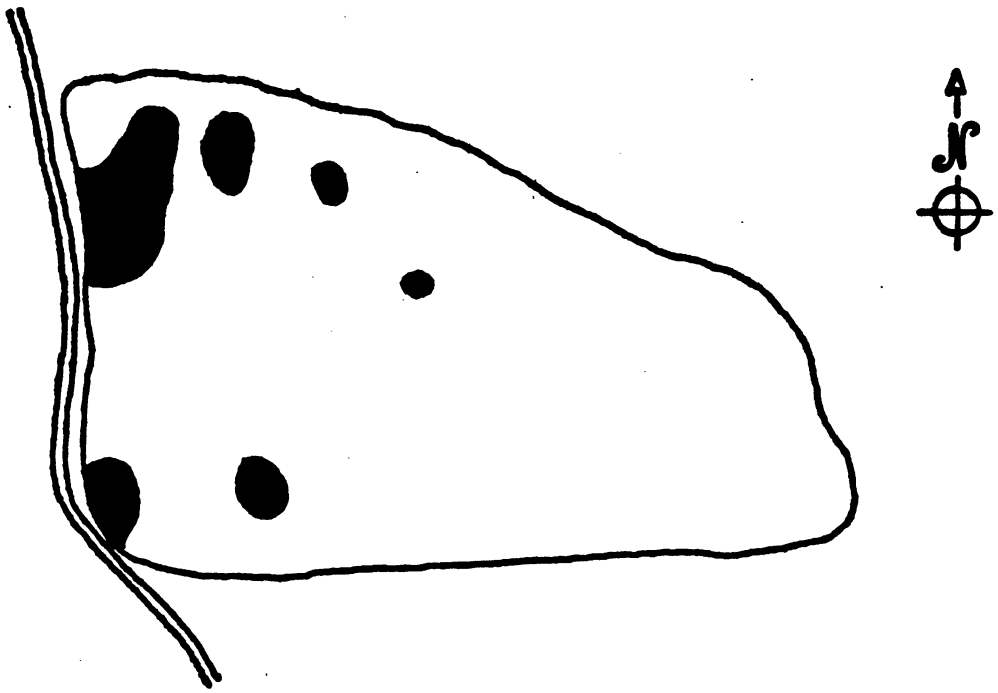

Fig. 22: Map of Deadwood Bottom 2 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

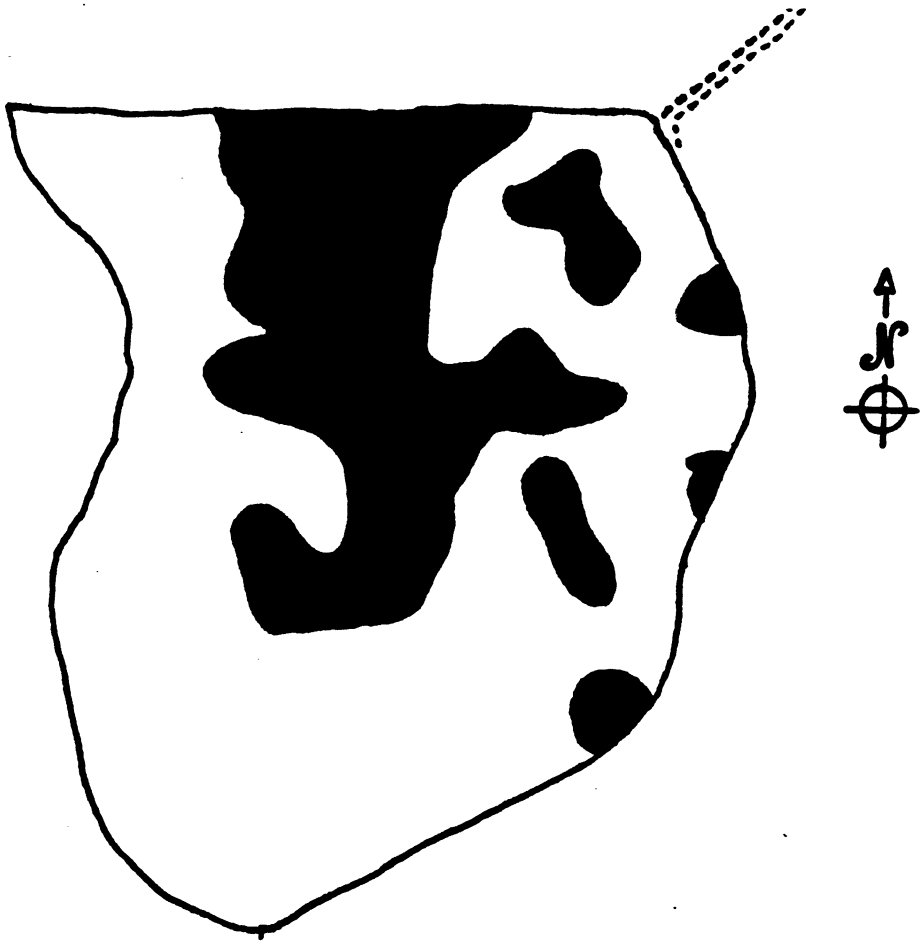

Fig. 23: Map of Deadwood Bottom 3 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

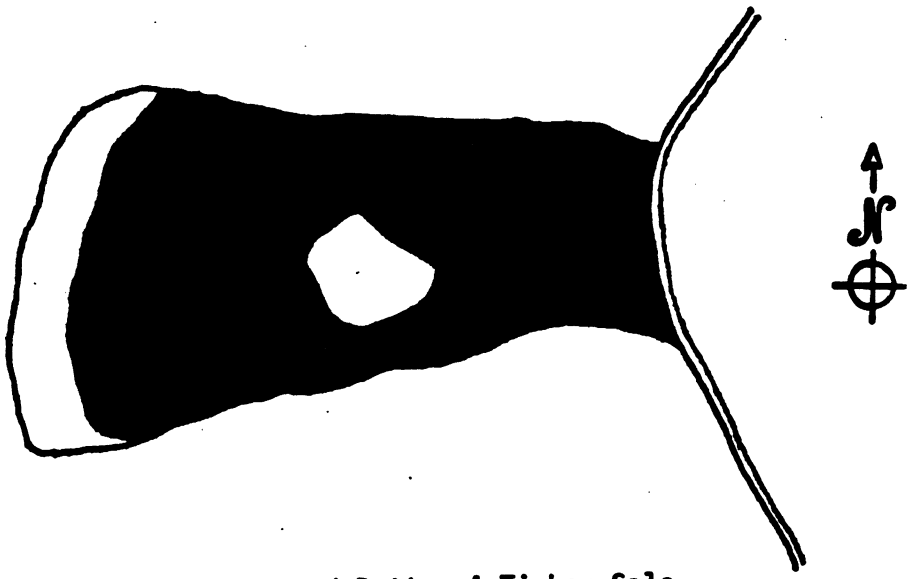

Fig. 24: Map of Deadwood Bottom 4 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

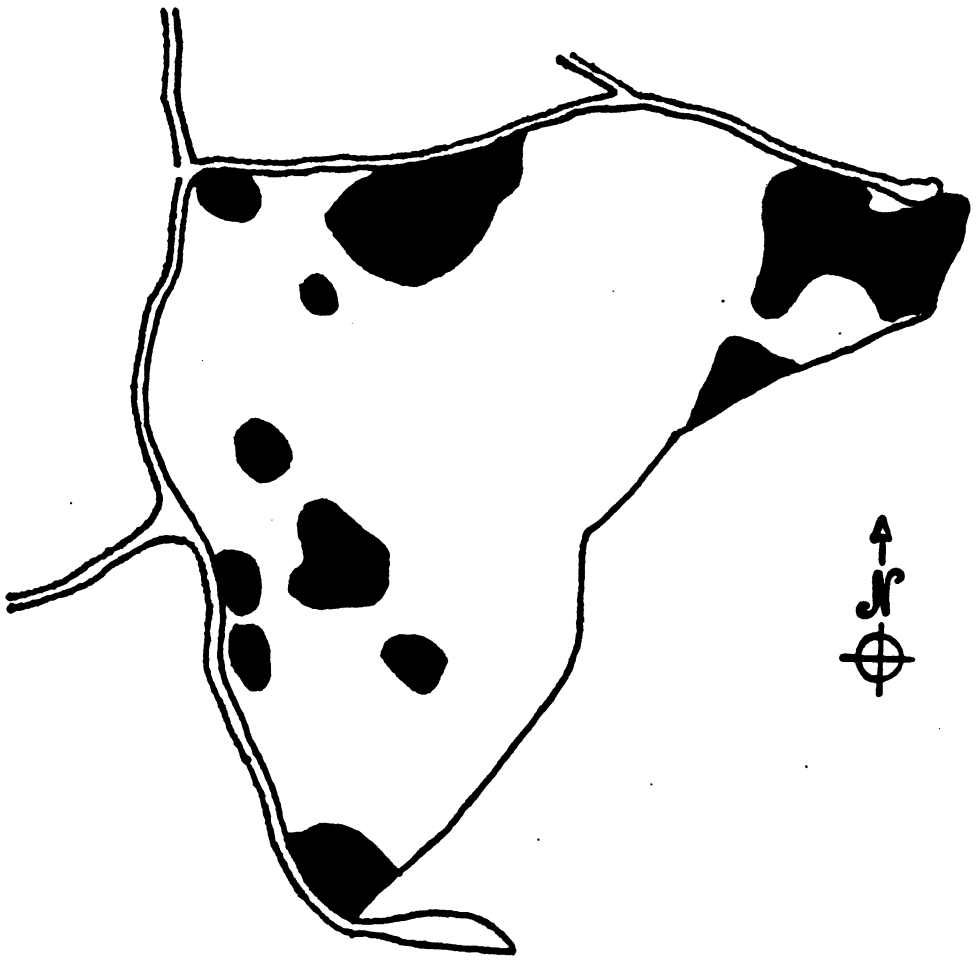

Fig. 25: Map of Deadwood Bottom 77 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

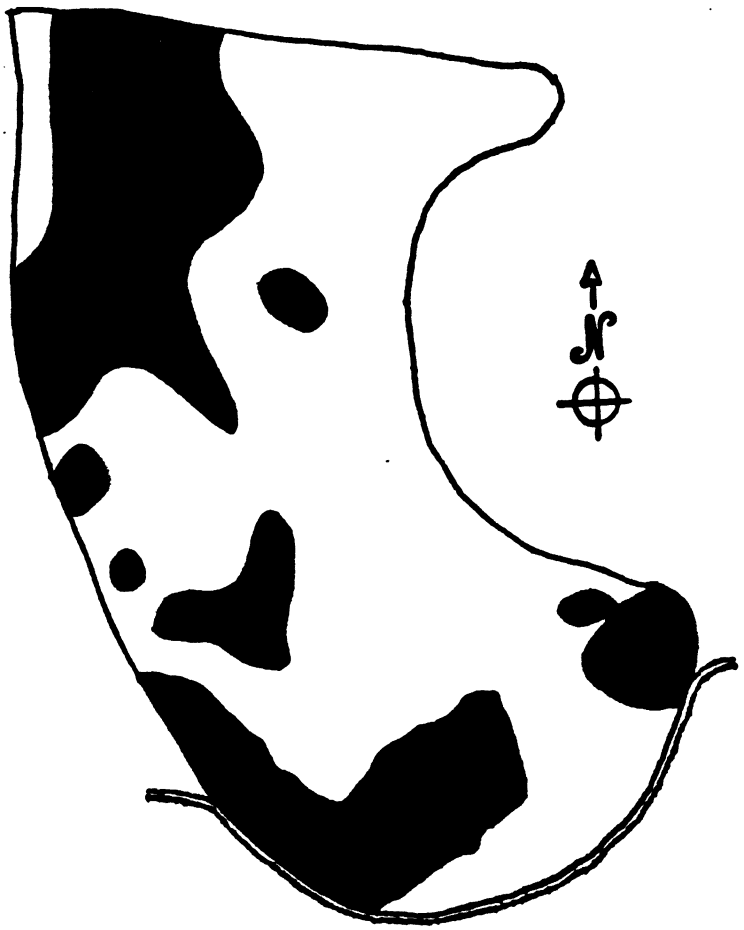

Fig. 26: Map of Divide Ridge 3503-106 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

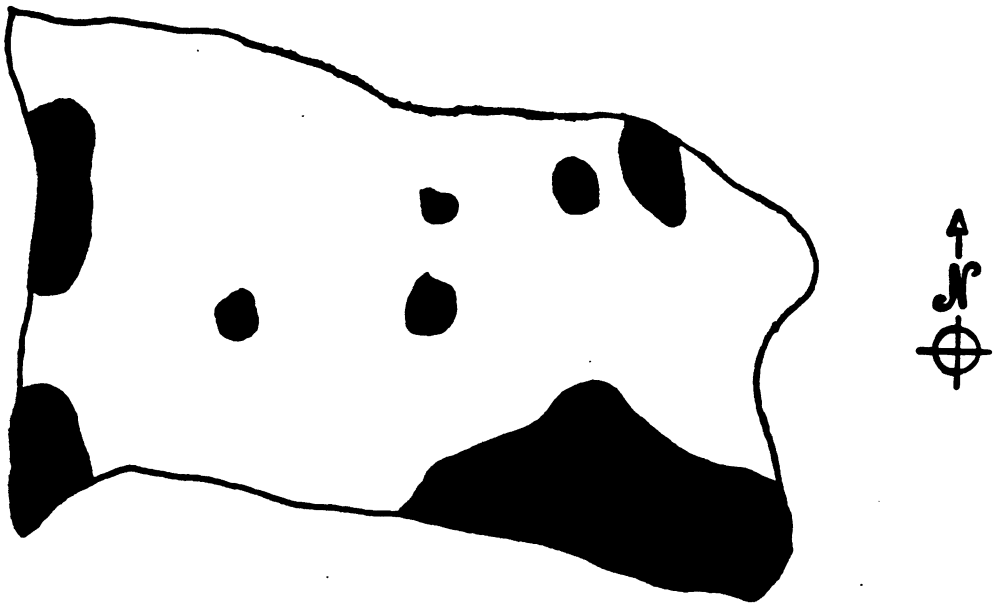

Fig. 27: Map of Divide Ridge 3503-107 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

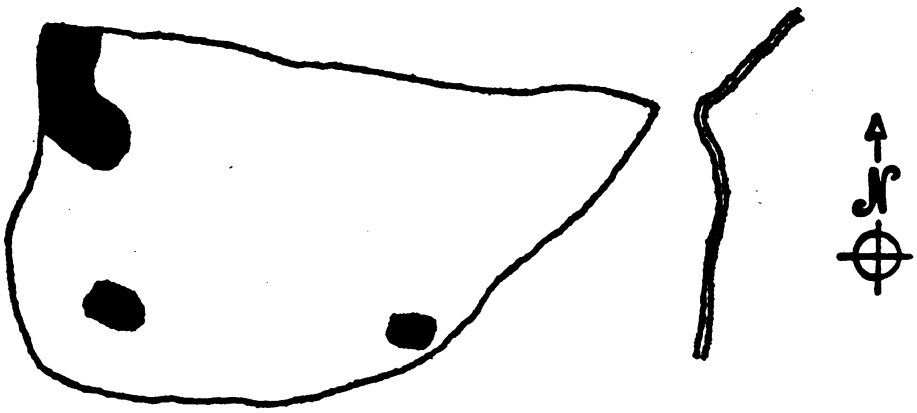

Fig. 28: Map of Divide Ridge 3503-108 Timber Sale showing areas affected by laminated root rot (shaded sections). Scale= 600 feet to the inch.

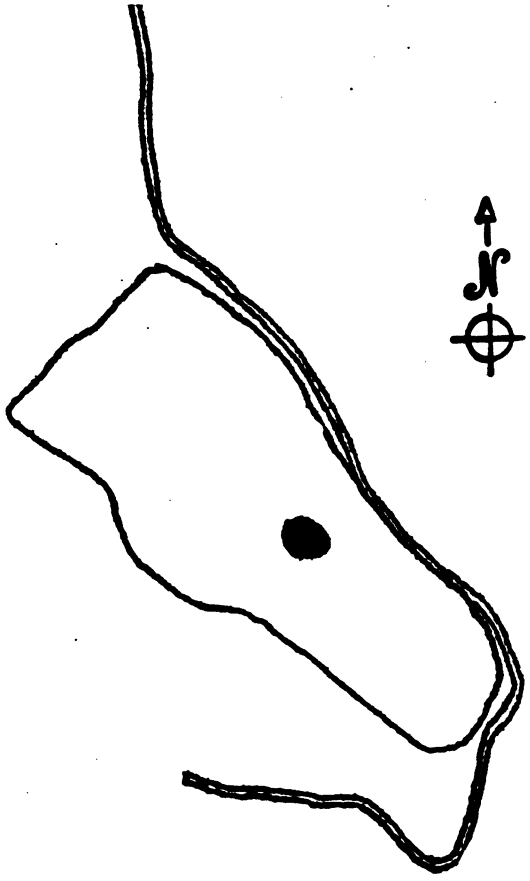

Fig. 29: Map of Divide Ridge 3503-109 Timber Sale showing area affected by laminated root rot (shaded section). Scale= 600 feet to the inch.

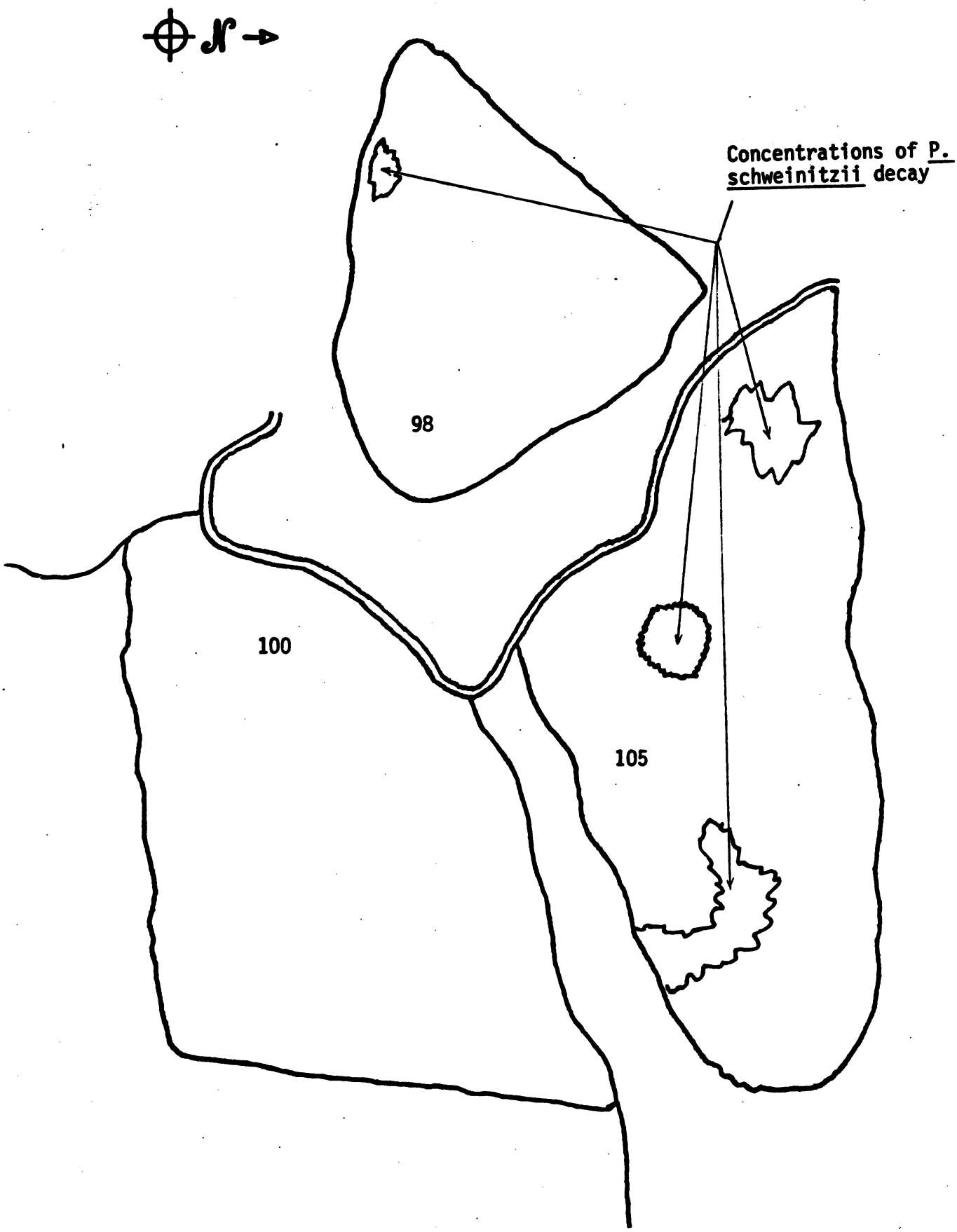

Fig. 30: Map of Divide Up 3503-98, Divide Ridge 3503-105, and Divide Up 3503-100 Timber Sales. Scale= 300 feet to the inch.

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